

3.6 NOISE

This section describes the methodology and results of an analysis of existing exterior noise levels near the sites of the Proposed Action and its alternatives. The ROI selected for the analysis covers the areas immediately surrounding the sites. However, the analysis employed a travel demand forecast model used by the Gulfport Regional Planning Commission (GRPC) that encompasses all developable land of all land use types in the Mississippi Gulf region. Since the land area and usage covered in the modeling is so extensive, all types of effects on the noise environment are accounted for in the modeling.

3.6.1 Units of Exterior Noise Measurement Used in the Analysis

The analysis measured external noise levels in units of "A-weighted, equivalent continuous decibel levels," or "Leq dBA." An explanation of these units of measurement provides a useful foundation for a discussion of the noise analysis.

Noise, which is defined as undesirable sound, is characterized by two properties – frequency (or "pitch") and loudness. To measure noise loudness, which is measured in decibels (dBs), the dB unit must be adjusted to account for three factors – the influence of pitch on perceived loudness, the fluctuation of noise levels over time, and the extra noise-sensitivity of the nighttime hours, typically defined as the period between 10 PM and 7 AM.

Although the human ear may hear two sounds that have the same loudness level, the higher-pitched sound will seem louder than the other, lower-pitched sound. To adjust for this subjective perception of loudness, decibel values are "A-weighted" and the unit of measurement becomes the dBA.

In addition to adjustments needed to account for pitch, loudness measurements must also be adjusted to account for the variation of noise levels over time. For example, noise levels from traffic fluctuate as traffic volumes wax and wane over the course of a given morning. Thus, a unit of noise measurement must be used that treats traffic dBA levels as steady sound energy by taking the average of traffic-generated sound levels over a stated period of time (in this particular example, over the course of the morning). To this end, the analysis uses an equivalent continuous sound level (Leq) as the unit of noise measurement. A-weighted and measured in decibels, the unit is represented as "Leq dBA."

To account for noise levels produced during nighttime, measurements of Leq sound levels can be converted to Day-Night Average Sound Levels (DNL). For noise generated by a specific source, a DNL is computed by adding a 10-dB penalty to the Leq value of noise levels generated during nighttime operations, and then, using the penalty-added values, calculating the average Leq over a 24-hour period.

The analysis described herein compares allowable dBA noise levels with existing Leq dBA levels. To understand the real-world significance of an existing level's divergence from an allowable level, it is useful to note that a 10-dBA increase in the sound level is equivalent to a

doubling of the sound level as heard by the human ear. Figure 3.6-1, which illustrates some common A-weighted noise levels, provides examples of how relative differences in dBA levels are manifested.

Table 3.6-1
FHWA/MDOT Noise Abatement Criteria (NAC) (23 C.F.R. 772)
Maximum Hourly Sound Level (Leq dBA)

Activity Category	Maximum Leq dBA	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: C.F.R., 1982.

3.6.2 Existing Noise Sources

The primary noise source for all sites (i.e., sites for Alternatives 1 through 5) is vehicular traffic. Therefore, this analysis focuses on that particular mobile source of noise. Other than some typical marine activities, no prominent stationary sources of noise are located on or near the sites of the "build" alternatives (Alternatives 2, 3, 4, and 5).

Vehicular traffic on US 90 is the primary source of noise affecting the immediate vicinity of the Broadwater site (Alternatives 2, 4, and 5). Other, non-primary sources affecting sound levels near this site are local traffic volumes, pedestrian noise, marine activities, and overflights from Keesler AFB. The noise levels near the Alternative 3 sites are generated by surrounding mixed commercial, residential, casino, and marine land uses. These sites, which do not abut any high-traffic volume roadways, are affected primarily by local vehicle traffic and indirectly by non-abutting arterial roads, including Division, Bayview, and US 90. Other, non-primary sources affecting sound levels at these sites are local traffic volumes, pedestrian noise, marine activities, and overflights from Keesler AFB.

As shown in Table 3.6-2, both the Broadwater site and the Alternative 3 sites lie outside Keesler AFB's 65-dB noise contour. Thus, the exterior noise levels of overflights at the sites are within the residential exterior noise standard used by FAA.

3.6.3 Existing Noise Levels

Due to the significant differences in spatial distribution between the Alternatives 2, 4, and 5 site and the Alternative 3 sites, different approaches were taken to characterize existing noise conditions near these two groups of sites. The analysis for the Alternatives 2, 4, and 5 site examined numerous, specific locations for several land uses near the site that would be considered noise-sensitive receptors. By comparison, the dispersed nature of the Alternative 3 sites precluded such an in-depth analysis, since thousands of potential noise receptors exist near these sites. Therefore, the analysis for the Alternative 3 sites depended on a general characterization of noise conditions near the sites.

The analyses for both groups of sites compared estimated existing noise levels with desired noise levels for various land uses located adjacent to highways. Specifically, the analysis used the Noise Abatement Criteria (NAC) described in Part 772 of Title 23 of the Code of Federal Regulations (City of Biloxi, 1992). These standards have been adopted by the Mississippi Department of Transportation (MDOT) Highway Traffic Noise Policy and are listed in Table 3.6-1. The standards categorize land uses ("activities") according to degree of noise-sensitivity and assign maximum exterior or interior Leq values to the five categories (A, B, C, D, and E). Categorized land uses range from "lands on which serenity and quiet are of extraordinary significance" (Category A) to commercial establishments (included in Category C).

Alternatives 2, 4, and 5

The main source of noise levels near the Alternatives 2, 4, and 5 site is vehicular traffic on US 90. The analysis of noise near the Alternatives 2, 4, and 5 site examined several different neighboring land uses as potential noise-sensitive receptors. These include:

- Commercial sites north and immediately abutting US 90;
- Residential areas immediately east and west of the site and north of US 90;
- Southern Memorial Park Cemetery immediately east of the site and abutting US 90;
- Broadwater Gulf Exposition Hall/Center near the cemetery;
- Jefferson Davis Library & Museum, west of both the site and residential areas and north of US 90;
- Playground/basketball courts north of the Broadwater Towers Hotel, and;
- Three historic sites at the Beauvoir house, west of the site and abutting US 90 to the north (near the Jefferson Davis Library & Museum).

Six sites representative of the existing land uses in the vicinity of the Alternatives 2, 4, and 5 site were selected for measurement of actual, existing noise levels generated from US 90 (see Table 3.6-2). From April 14, 1998 through April 15, 1998, a field survey team from Michael Baker Jr., Inc. measured the noise levels generated by US 90 at the six sample sites during peak traffic hours. These noise levels collected at the sites (see Table 3.6-2) were input into a MDOT/FHWA STAMINA 2.0 Model in order to calibrate the model for estimating the existing decibel levels at 70 potential noise receptor sites near the Alternatives 2, 4, and 5 site. The noise sampling at the six selected sites used a fleet mix consisting of 94 percent automobiles, pickup trucks and vans; 1.8 percent medium trucks (2-axle, 6-tire vehicles); and 4.2 percent heavy trucks (vehicles with 3 or more axles). The Metrosonics dB-312 Sound Level Analyzer used computed the Leq noise level for the period during which the samples were collected. A Metrosonics CL-304 Acoustical Calibrator was used to calibrate the analyzer before and after each measurement.

Table 3.6-2
Existing, Exterior Noise Levels Measured at Six Representative Sites
near Alternatives 2, 4, and 5 Site*

Id #	Location & Facility	Traffic Noise Source	Facility Distance from Alts. 2, 4, 5 Site (m [ft])	23 C.F.R. 772 Noise Abatement Criteria Leq dBA	Measured Existing Leq dBA
4	Beauvoir House Administrator's residence	US 90	54 (178)	67	62
8	West side of Sadler Beach Dr. - Residence	US 90	26 (85)	72	69
20	Office of Beauvoir Beach Apts., on US 90	US 90	26 (85)	72	69
54	Southern Memorial Park Cemetery	US 90	61 (200)	72	61
57	House of Chin Restaurant on US 90	US 90	22 (73)	72	70
69	Park area near site	US 90	108 (355)	67	59

Source: Baker, 1999c.

* Although the 23 C.F.R. 772 standard noise level is shown here, the primary purpose of collecting these six sample noise levels was not to compare existing noise levels with the standard. Rather, it was to calibrate a MDOT/FHWA STAMINA 2.0 Model for the estimation of noise levels at 70 potential noise-sensitive receptor sites in the vicinity of the Broadwater site.

After the model was run, the model-estimated decibel levels for the 70 potential noise receptors were compared to the desired 23 C.F.R. 772/ MDOT noise levels listed in Table 3.6-1. Table 3.6-3 shows the estimated existing noise level for each of the 70 sites, along with the corresponding C.F.R./MDOT level. For the geographic distribution of the 70 receptor sites, see the Air and Noise Modeling Technical Report prepared by Baker (Baker, 1999c).

Table 3.6-3
Estimated Existing, Exterior Noise Levels Generated by US 90
for 70 Sites near Alternatives 2, 4, and 5 Site*
(Leq dBA)

Id #	Location & Facility	Facility Distance from Alts. 2, 4, 5 Site (m [ft])	23 C.F.R. 772 Noise Abatement Criteria NAC Leq dBA	Estimated Existing Leq dBA
Beauvoir (Historical Residential) - FHWA/MDOT NAC Category B				
1	Historic structure	44 (143)	67	65
2	Historic structure	58 (191)	67	64
3	Historic structure	37 (120)	67	67
4*	Administrator's residence	54 (178)	67	64
West Side of Sadler Beach Drive (Residential) - FHWA/MDOT NAC Category B				
8*	Residence	155 (507)	67	59
9	Residence	229 (750)	67	50
10	Residence	283 (927)	67	49
Rodeway Inn (Motel) - FHWA/MDOT NAC Category B				
12	Sadler Beach Drive	58 (191)	67	64
13	Sadler Beach Drive	102 (335)	67	60
14	Sadler Beach Drive	141 (462)	67	57
East Side of Sadler Beach Drive (Residential) - FHWA/MDOT NAC Category B				
15	Residence	152 (500)	67	53
16	Residence	169 (555)	67	52
17	Residence	209 (686)	67	51
18	Residence	227 (744)	67	50
19	Residence	291 (955)	67	48
Beauvoir Beach Apartments (Residential) - FHWA/MDOT NAC Category B				
20*	Office on US 90	26 (85)	72	70
21	6 units	38 (124)	67	66
22	4 units	74 (242)	67	60
23	6 units	94 (310)	67	56
24	4 units	136 (445)	67	54
25	6 units	153 (503)	67	53
26	4 units	190 (622)	67	52
27	6 units	209 (686)	67	51
28	4 units	253 (830)	67	50
29	6 units	265 (871)	67	49
30	4 units	302 (990)	67	48

Id #	Location & Facility	Facility Distance from Alts. 2, 4, 5 Site (m [ft])	23 C.F.R. 772 Noise Abatement Criteria NAC Leq dBA	Estimated Existing Leq dBA
Broadwater Beach Resort Hotel (Hotel) - FHWA/MDOT NAC Category B				
32	Cottage - 2 units	20 (67)	67	68
33	Cottage - 1 unit	51 (167)	67	62
34	60 units	113 (371)	67	57
35	Cottage - 2 units	234 (769)	67	51
36	Cottage - 2 units	260 (853)	67	50
37	Garden Apts. - 50 units	229 (750)	67	52
38	Garden West Wing - 120 units	256 (840)	67	50
39	Garden East Wing - 46 units	266 (873)	67	51
40	Changing rms / swimming	235 (771)	67	51
41	Snack bar @ pool area	227 (744)	67	51
42	Cottage - 2 units	210 (688)	67	52
43	Basketball court/playgrd.	183 (600)	67	52
44	Executive cottage - 1 unit	158 (518)	67	54
45	Executive cottage - 2 unit	165 (542)	67	54
46	Executive cottage - 2 unit	175 (573)	67	53
47	Executive cottage - 2 unit	152 (499)	67	54
48	Executive cottage - 2 unit	137 (449)	67	55
49	Machinery shop bldg.	52 (170)	N/A**	68
50	Park East Wing - office bldg.	90 (295)	72	62
51	Grounds security bldg.	82 (270)	72	61
52	Park West Wing - 11 units	80 (261)	67	61
53	Main bldg. & terrace - 33 units	24 (80)	67	73
Days Inn Hotel (Hotel) - FHWA/MDOT NAC Category B				
58	Unit A = 48 rooms	135 (442)	67	62
59	Unit B = 36 rooms	180 (589)	67	60
60	Unit C = 48 rooms	214 (701)	67	56
61	Unit D = 48 rooms	272 (893)	67	50
Other sites (Misc.) - FHWA/MDOT NAC Categories B & C				
5	Jefferson Davis Library & Museum	122 (400)	67	58
6	Denny's Restaurant on US 90	8 (27)	72	75
7	Two Loventeen - commercial	104 (342)	72	61
54*	Southern Memorial Park Cemetery	61 (200)	72	63
55	Broadwater Gulf Hall exposition center	16 (51)	67	75
56	Broadwater Towers Hotel - 71 rooms	52 (170)	67	69
57*	House of Chin Restaurant on US 90	22 (73)	72	71
62	Souvenir City / T-shirt World on US 90	11 (37)	72	76
63	Italian Restaurant	65 (213)	72	69
64	Residential home	145 (475)	67	56
65	Residential home	185 (607)	67	52
66	Residential mobile home unit	219 (718)	67	51

Id #	Location & Facility	Facility Distance from Alts. 2, 4, 5 Site (m [ft])	23 C.F.R. 772 Noise Abatement Criteria NAC Leq dBA	Estimated Existing Leq dBA
67	Broadwater Resort Restaurant & Lounge	227 (746)	72	59
68	Harbour Master office bldg @ casino site	274 (899)	72	57
69*	Park area near marina @ casino site	108 (355)	67	62
11	Texaco / Foodmart on North side US 90	25 (82)	N/A**	71
31	Vacant wooded lot - undeveloped	---	N/A**	**
70	Boat Marina & slip facility	59 (195)	N/A**	70

* Actual Leq dBA level was measured for this site. See Table 4.6-3 for actual existing level.

** 23 C.F.R. 7.7.2 maximum noise levels do not apply to service stations, industrial areas, storage areas and other areas having limited human use or where lowered noise levels would produce little benefit.

Source: Air & Noise Modeling Technical Report.

Of the 70 sites, nine sites have estimated noise levels that approached or exceeded the MDOT/FHWA NAC levels. Table 3.6-4 shows the geographic locations as well as the existing and standard noise levels for the sites. Three of the sites – Denny’s Restaurant, the House of Chin Restaurant, and Souvenir City/T-Shirt World – are NAC Category C receptors. The other six sites are NAC Category B receptors.

Table 3.6-4
Sites in Vicinity of Alternatives 2, 4, and 5 where Estimated Exterior Existing Noise Levels Approach or Exceed NAC Levels

Id #	Location & Facility	Facility Distance from US 90 (m (ft))	23 C.F.R. 772 Noise Abatement Criteria NAC Leq dBA	Estimated Existing Leq dBA
West of the resort and abutting US 90 to the north				
3	Historic structure at Beauvoir House	37 (120)	67	67
6	Denny’s Restaurant on US 90	8 (27)	72	75
21	6-unit structure at Beauvoir Beach Apartments	38 (124)	67	66
Immediately north of US 90 and the resort marina				
32	One 2-unit cottage at Broadwater Beach Resort Hotel	20 (67)	67	68
53	Main building and terrace (33 units) at Broadwater Beach Resort Hotel	24 (80)	67	73
East of the resort and abutting US 90 on the north side				
55	Broadwater Gulf Exposition Hall/Center	16 (51)	67	75
56	Broadwater Towers Hotel - 71 rooms	52 (170)	67	69
57	House of Chin Restaurant on US 90	22 (73)	72	71
62	Souvenir City / T-shirt World on US 90	11 (37)	72	76

Source: Baker, 1999c.

1 *Alternative 3*

2
3 Due to the thousands of potential noise receptors located near the Alternative 3 sites, existing
4 noise conditions near these sites were characterized generally. Using the scale of outdoor noise
5 levels for common noise-producing situations shown in Figure 3.6-1, the analysis conservatively
6 defined the areas around the Alternative 3 sites as typical, quiet, urban noise environments with
7 maximum-tolerated daytime sound levels of 55 dBA Leq. Thus, the analysis set the maximum
8 noise level for the areas at 55 dBA Leq.

9
10 Potential vehicle traffic noise receptors in the area were then categorized using the
11 MDOT/FHWA criteria shown in Table 3.6-1. Since none of the Alternative 3 sites abut any high
12 traffic volume roadways, it was estimated that none of the receptors approached or exceeded the
13 MDOT/FHWA criteria level set for the given category of receptor.
14

Destination Broadwater EIS

Noise Levels for Common Outdoor and Indoor Situations (dBA)

COMMON OUTDOOR NOISE LEVELS

Jet Flyover at 1000 ft.
Gas Lawnmower at 3 ft.
Diesel Truck at 50 ft. Noisy Urban Daytime
Gas Lawnmower at 100 ft.
Commercial Area Heavy Traffic at 300 ft.
Quiet Urban Daytime
Quiet Urban Nighttime
Quiet Suburban Nighttime
Quiet Rural Nighttime

NOISE LEVEL

110
100
90
80
70
60
50
40
30
20
10
0

COMMON INDOOR NOISE LEVELS

Inside Subway Train (New York)
Food Blender at 3 ft.
Garbage Disposal at 3 ft.
Shouting at 3 ft.
Vacuum Cleaner at 10 ft.
Normal Speech at 3 ft.
Large Business Office Dishwasher Next Room
Small Theater, Large Conference Room (Background)
Library
Bedroom at Night
Concert Hall (Background)
Broadcast and Recording Studio
Threshold of Hearing

Figure 3.6-1: Noise levels for common outdoor and indoor situations (dBA) - Source: FHWA, 1980